

What is claimed is:

1. A method for replacing a failed data session slave control unit (GTP-C/s) in a Gateway General Packet Radio Service (GPRS) Support Node (GGSN), the method comprising the steps of:

detecting a failure or a shutdown of the GTP-C/s in the GGSN;

5 detecting if the failed GTP-C/s controlled any data sessions before it failed;

if the failed GTP-C/s controlled any data sessions before it failed, closing all the data sessions and accounting sessions related to the data sessions.

2. The method claimed in claim 1, further comprising the steps of:

detecting a presence of a spare, non-utilized, data session control unit (GTP-C spare) in the GGSN;

5 assigning to the GTP-C spare a role of GTP-C/s by assigning an IP address previously held by the GTP-C/s that failed to the GTP-C spare; and starting the GTP-C spare as a GTP-C/s.

3. The method of claim 1, wherein the step of detecting a failure or a shutdown of the GTP-C/s in the GGSN comprises the step of:

detecting in the GGSN a lack of a heartbeat message sent by the failed GTP-C/s.

4. The method claimed in claim 1, wherein the step of detecting if the failed GTP-C/s controlled any data sessions before it failed, comprises the step of:

detecting if the failed GTP-C/s comprises any PDP context before it failed.

5. The method claimed in claim 4, wherein the step of detecting if the failed GTP-C/s comprises any PDP context before it failed, is performed in a master data session control unit (GTP-C/m) of the GGSN.

6. The method claimed in claim 1, wherein the step of closing all the data sessions comprises the steps of:

transmitting from a master data session control unit (GTP-C/m) of the GGSN to each data session payload unit (GTP-U) of the GGSN a Close Session message requesting that all active data sessions controlled by the GTP-C/s that
5 failed be closed; and

closing by each GTP-U of the GGSN all active data sessions controlled by the GTP-C/s that failed.

7. A method for replacing a failed data session master control unit (GTP-C/m) in a Gateway General Packet Radio Service (GPRS) Support Node (GGSN), the method comprising the steps of:

detecting a failure or a shutdown of the GTP-C/m in the GGSN;
5 detecting, among all remaining data session control units (GTP-C) available in the GGSN, the GTP-C with the least load, and electing the GTP-C with the least load as a fail-over unit for the GTP-C/m that failed;

recovering by the elected fail-over GTP-C information related to the failed GTP-C/m from other GTP-C units;

10 rebuilding by the elected GTP-C a GTP-C/m information database using the information related to the failed GTP-C/m; and

starting the elected GTP-C as a GTP-C/m of the GGSN.

8. The method claimed in claim 7, wherein the step of detecting a failure or a shutdown of the GTP-C/m in the GGSN comprises the step of:

detecting in the GGSN a lack of a heartbeat message sent by the failed GTP-C/m.

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9. The method claimed in claim 7, wherein the step of detecting the GTP-C with the least load, comprises the step of:

sending a GTP-C failure notification to each remaining GTP-C units of the GGSN.

10. The method claimed in claim 7, wherein the GTP-C detected to have the least load is a spare, non-utilized, GTP-C unit of the GGSN.

11. The method claimed in claim 7, wherein the GTP-C detected to have the least load is a slave GTP-C selected among all active slave GTP-Cs of the GGSN.

12. The method claimed in claim 7, further comprising, before the step of recovering, the step of:

closing by the selected slave GTP-C all currently controlled Packet Data Protocol (PDP) Contexts related to its supported data sessions.

13. A Gateway General Packet Radio Service (GPRS) Support Node (GGSN), comprising:

5 a plurality of slave data session control units (GTP-C/s), each being set to controlling a plurality of data sessions for Mobile Stations (MSs);

a plurality of data sessions payload units (GTP-Us) for supporting a routing of a payload of the data sessions; and

10 a master data session control unit (GTP-C/m) detecting a failure or a shutdown of one of the GTP-C/s of the GGSN, the GTP-C/m further detecting if the failed GTP-C/s controlled any data sessions before it failed, and if the failed GTP-C/s controlled any data sessions before it failed, the GTP-C/m requesting from the plurality of GTP-Us to close all the data sessions;

wherein the GTP-Us respond to the request by closing all accounting sessions related to the data sessions.

14. The GGSN claimed in claim 13, wherein the GGSN further comprises a spare, non-utilized, data session control unit (GTP-C spare), and wherein:

5 the GTP-C/m detects a presence of a spare, non-utilized, data session control unit (GTP-C spare) in the GGSN, the GTP-C/m replaces the failed GTP-C/s with the GTP-C spare by assigning an IP address previously held by the GTP-C/s that failed, and a role of GTP-C/s, to the GTP-C spare, and starts the GTP-C spare as a GTP-C/s.

15. The GGSN claimed in claim 13, wherein the GTP-C/m detects the failure or the shutdown of the GTP-C/s by detecting a lack of a heartbeat message sent by the failed GTP-C/s.

16. The GGSN claimed in claim 13, wherein the GTP-C/m detects if the failed GTP-C/s controlled any data sessions before it failed by detecting if the failed GTP-C/s comprises any PDP context before it failed.

17. The GGSN claimed in claim 13, wherein:

the GTP-C/m transmits to each GTP-U of the GGSN a Close Session Request message for requesting that all active data sessions controlled by the GTP-C/s that failed to be closed; and

5 responsive to the Close Session Request message, each GTP-U of the GGSN close all active data sessions controlled by the GTP-C/s that failed.

18. A Gateway General Packet Radio Service (GPRS) Support Node (GGSN), comprising:

a master data session control unit (GTP-C/m);

a plurality of data session control units (GTP-Cs); and

5 an Routing Engine (RE) detecting a failure or a shutdown of the GTP-C/m;

wherein the RE in combination with all remaining GTP-Cs available in the GGSN further detects the GTP-C with the least load, and elect the GTP-C with the least load as a fail-over unit for the GTP-C/m that failed, and wherein the
10 elected GTP-C recovers information related to the failed GTP-C/m from the remaining GTP-C units, rebuilds a GTP-C/m information database using the information related to the failed GTP-C/m, and starts acting as a GTP-C/m of the GGSN.

19. The GGSN claimed in claim 18, wherein the RE detects the failure or the shutdown of the GTP-C/m in the GGSN by detecting a lack of a heartbeat message sent by the failed GTP-C/m.

20. The GGSN claimed in claim 18, wherein for detecting the GTP-C with the least load the RE sends a GTP-C failure notification to each remaining GTP-C units of the GGSN.

21. The GGSN claimed in claim 18, wherein the GTP-C detected to have the least load is a spare, non-utilized, GTP-C unit of the GGSN.

22. The GGSN claimed in claim 18, wherein the GTP-C detected to have the least load is a slave GTP-C selected among all active slave GTP-Cs of the GGSN.

23. The GGSN claimed in claim 18, wherein before recovering the information related to the failed GTP-C/m from the remaining GTP-C units, the elected GTP-C closes all currently controlled Packet Data Protocol (PDP) Contexts related to its supported data sessions.